National Electric Service Company were employed, was a thorough success. Exposures were made at intervals of six seconds.

A few hours before the eclipse came on, the *Pensacola* went out to sea, and stood in the centre of the eclipse-track at the time of totality. Atmospheric conditions were slightly more favourable there than at the main station of the Expedition, and some interesting results were obtained. During totality, however, the clouds were so thick that it is very doubtful whether the true solar corona was seen at all.

The Eclipse Station was completely dismantled by December, 27, and the *Pensacola* left Cape Ledo on the afternoon of the same day.

Returning to Loanda, it was found that two of the three detached parties of the Expedition sent into the interior to observe the eclipse were unsuccessful on account of clouds. The third has not yet been heard from.

DAVID P. TODD.

U.S.S. *Pensacola*, December 31, 1889.

SCIENTIFIC SERIALS.

Rendiconti del Reale Istituto Lombardo, December.—Results obtained from Dr. L. Weigert's therapeutic treatment of pulmonary phthisis, by Prof. A. Visconti. Seven patients in various stages of consumption have been subjected to this treatment for the purpose of testing its efficacy. It consists in administering superheated dry air (150° to 180° C.), which is inhaled through a specially prepared apparatus, for which Dr. Weigert claims that it acts directly on Koch's bacillus of tuberculosis. In the incipient stages of the disease satisfactory results were obtained in some respects, such as relief of the cough, greater freedom of respiration, less profuse perspiration, and increased appetite. But it was doubtful whether the germ itself was killed, while in the advanced stages the malady continued its normal development without being perceptibly arrested by the treatment. Without actually condemning Weigert's method, Prof. Visconti cannot at present regard it as an efficacious remedy against phthisis.—On the determination of the coefficient of dynamic and electromotor produce, by P. Guzzi. The author here describes a method of determining this coefficient, for which he claims certain advantages over that proposed by Dr. J. Hopkinson in the *Electrician* of December 3, 1886, especially in the case of engines of over 100 horse-power. His method of calculating the yield of the dynamo and electric motors is based exclusively on electric measurements made with safer and more handy instruments than Hopkinson's dynamometers. Two dynamos of about the same type and dimensions are connected together in such a way that one moves the other as motor, as in the Hopkinson apparatus. But instead of communicating to the system the *dynamic energy* required to maintain it in motion with the velocity and intensity of the normal current, Guzzi's instrument communicates the equivalent *electric energy* derived from any external source whatsoever.

Rivista Scientifico-Industriale, December 31, 1889.—Researches on the absorption of hydrogen by iron, and on the tenacity of certain metals after absorbing gases, by Prof. M. Bellati and S. Lussana. It has already been shown by Hughes (NATURE, vol. xxi., 1880, p. 602) that steel and iron immersed in diluted sulphuric acid become very brittle, and that the same phenomenon is produced when these metals are used as negative electrodes in a voltameter. Prosecuting the same line of research, the authors here describe a series of experiments tending to show that the action of electrolytic oxygen on the tenacity of platinum, and of hydrogen on that of copper and zinc, is uncertain; also, that the absorption of hydrogen produces very probably an increase of tenacity in platinum, as it certainly does in iron, but, on the contrary, a diminution in nickel. Nor can these different results be explained by the simple passage of the current, Möbius having already shown that the elasticity of metals is not perceptibly affected by this cause.—Action of arsenate of hydrogen on potassium permanganate, by D. Tivoli. Some experiments are described, from the results of which the author infers that the solution of potassium permanganate is capable of rapidly and completely absorbing arsenate of hydrogen.—S. Giuseppe Terrenzi gives a somewhat complete list of the land and fresh-water mollusks occurring in the Narni district, Umbria. This fauna presents nothing remarkable, all the species being common to other parts of Umbria, and generally to Central Italy. All are described or mentioned by the Marchese Paolucci in his "Étude de la Faune Malacologique terrestre et fluviale de l'Italie et de ses îles" (Paris, 1878).

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 30.—"On the Germination of the Seed of the Castor-oil Plant (*Ricinus communis*)." By J. R. Green, M.A., B.Sc., F.L.S., Professor of Botany to the Pharmaceutical Society of Great Britain. Communicated by Prof. M. Foster, Sec. R.S.

The work embodied in this paper deals (*a*) with the agencies which, during germination, render the reserve materials available for the use of the embryo, (*b*) with the forms in which these are absorbed by it and the mode of their absorption, and (*c*) with the parts played in the process by the endosperm and the embryo respectively.

A ferment is found to exist as a zymogen in the resting seed, which is readily developed by warmth and weak acids into an active condition. The results of its activity are the splitting up of the fat with formation of glycerine and (chiefly) ricinoleic acid. Further changes, brought about by the protoplasm of the endosperm cells, form from the latter a lower carbon acid which, unlike ricinoleic acid, is soluble in water and is crystalline. These changes do not take place in the absence of free oxygen. A quantity of sugar also is formed, which appears to have the glycerine as its antecedent.

The proteids of the seed, which consist of globulin and albumose, are split up by another ferment, with formation of peptone and asparagin.

The only products which enter the embryo are a crystalline acid, sugar, possibly some peptone, and asparagin. Consideration of the structure of the cotyledons, which are the absorbing organs, shows that the mode of absorption is always dialysis.

"Investigations into the Effects of Training Walls in an Estuary like the Mersey." By L. F. Vernon Harcourt, M.A., M.Inst.C.E. Communicated by A. G. Vernon Harcourt, F.R.S.

The present investigations were carried out with a working model of the Mersey estuary, from near Warrington to the open sea beyond the bar. The experiments were directed to the solution of two problems—namely, (1) the influence of training walls in the wide upper estuary on the channel below Liverpool, and across the bar; and (2) the effects of training walls in the lower estuary on the channel across the bar.

The experiments indicate that, whereas training walls in the upper estuary would be injurious, owing to the resulting accretion, training walls in the lower estuary would improve the depth of the outlet channel; and that such training walls, combined with dredging, offer the best prospect of forming a direct, stable, and deepened channel across the bar.

February 6.—"Memoir on the Symmetrical Functions of the Roots of Systems of Equations." By Major P. A. MacMahon, Royal Artillery. Communicated by Prof. Greenhill, F.R.S.

The object of the present memoir is the extension to systems of algebraical quantities of the new theory of symmetric functions which has been developed by the author in regard to a single system in vol. xi. and succeeding volumes of the *American Journal of Mathematics*. In the theory of the single system the conceptions and symbolism are to a large extent arithmetical, and are based upon the properties of single integral numbers and their partitions into single integral parts. In this sense the former theory may be regarded as being unipartite.

In the present generalization to the case of m systems of quantities the fundamental ideas proceed, not from a single number, but from a collection of m single numbers. In regard to number, weight, degree, part, and suffix, the collection of m numbers invariably replaces the single number of the theory of the single system. In this view the theory of the m systems is m-partite.

The quantities, to which the symmetric functions relate may be regarded as the solutions common to m non-homogeneous equations each in m variables. Schläfli, in the Vienna Transactions (*Denkschriften*) for 1852, added another linear non-homogeneous equation in m variables, and then forming the eliminant of the $m + 1$ equations, thereby obtained an identity which is fundamental in the subject. This identity involves those symmetric functions which are here termed fundamental, and marks the starting-point of the present investigation.

In particular, three distinct laws of symmetry are established, large generalizations of those established by the author in the *American Journal of Mathematics* (vol. xi.). Of these the first two are of fundamental importance, and are examined in detail. A leading idea in these theorems, as in the whole investigation, is the "separation" of a partition; the separation bearing the same relation to the partition as the partition to the number or collection of numbers.

In conclusion, the memoir consolidates and largely generalizes the author's recent researches alluded to above.

February 13.—"On the Unit of Length of a Standard Scale by Sir George Shuckburgh, appertaining to the Royal Society." By General J. T. Walker, R.E., F.R.S.

In the determinations of the length of the seconds pendulum, which were made in London by Kater and at Greenwich by Sabine, and are described in the Philosophical Transactions for 1818, 1829, and 1831, the distance between the upper and lower edges of the pendulum was measured off on a standard scale which had been constructed by Sir George Shuckburgh. The scale had not yet been compared with any of the modern standard scales, but it had been preserved with much care with the instruments appertaining to the Royal Society.

In the autumn of 1888, M. le Commandant Defforges, an officer of the French Geodetic Survey, came to England to take a share in operations for the determination of the difference in longitude between Greenwich and Paris, and also to determine the length of a French seconds pendulum at Greenwich. He kindly undertook to comply with a suggestion which was made to him by me, to compare the portion of Shuckburgh's scale which had been employed by Kater and Sabine with one of the standard metre bars of the International Bureau of Weights and Measures in Paris. The Council of the Royal Society assented, and the scale was sent across to Paris and brought back again by special agent.

The details and results of the comparison are given in a special account by Commandant Defforges, from which it will be seen that the scale was compared with the French metrical brass scale, N, at the temperature of 48°·7 F., at which the distance between Kater and Sabine's divisions, 0 and 39·4, of the Shuckburgh scale was found equal to 1·0006245 metre. On reducing to the temperature of 62° F., which was employed by Kater and Sabine, this distance becomes 1·0007619 metre, which is equivalent to 39·400428 inches if we adopt the relation 1 metre = 39·370432 inches, which was determined by Colonel Clarke, C.B., of the Ordnance Survey, and is given in his valuable work on the comparisons of standards of length. Thus the actual length of the space 0 to 39·4 on the Shuckburgh scale may be regarded with some probability as differing by not more than about 0·0004 inch, or, say, the 100,000th part, from the quantity which the scale indicates.

Physical Society, February 7.—Annual General Meeting.—Prof. Reinold, F.R.S., President, in the chair.—The reports of the Council and of the Treasurer were read and adopted. The former stated that there had been a very satisfactory increase in the number of members during the year. The number now exceeds 360, of whom 80 are Fellows of the Royal Society. During the year the Council had proposed to change the time of meeting of the Society from Saturday afternoon to Friday evening. The change was adopted by the members by a vote of 129 to 30, and had resulted in a larger attendance at the meetings. During the year the second part of vol. i. of the translations of important foreign memoirs had been issued to the members, and it was hoped that a third part would be published early in the present session. The Council had to regret the loss by death of three well-known members—James P. Joule, Warren de la Rue, and Father Perry. A valuable collection of books had been given the Society by the Royal Astronomical Society. From the Treasurer's report, it appeared that the balance of the Society had been increased by £120 during the year. Prof. Hittorf, of Münster, was, at the recommendation of the Council, elected an honorary member of the Society. The result of the new election of officers was declared as follows:—President: Prof. W. E. Ayrton, F.R.S.; Vice-Presidents: Dr. E. Atkinson, Walter Baily, Shelford Bidwell, F.R.S, and Prof. S. P. Thompson; Secretaries: Prof. J. Perry and T. H. Blakesley; Treasurer: Prof. A. W. Rücker, F.R.S.; Demonstrator: C. V. Boys, F.R.S.; other Members of Council: W. H. Coffin, Sir John Conroy, Bart., Conrad W. Cooke, Major-General Festing, F.R.S., Prof. J. V. Jones, Prof. O. Lodge, F.R.S., Prof. W. Ramsay, F.R.S., W. N. Shaw, H. Tomlinson, F.R.S., and G. M. Whipple. Votes of thanks were then passed (1) to the Lords of the Committee of the Council on Education for the use of the room in which the Society met; (2) to the auditors, Prof. Minchin and Dr. Fison; (3) to the President and officers of the Society for their services during the year.—The meeting was then resolved into an ordinary science meeting. Messrs. E. W. Smith and C. E. Holland were elected members of the Society, and Mr. Sidney Evershed was proposed as a member.—The paper on galvanometers, by Prof. W. E. Ayrton, F.R.S., Mr. T. Mather, and Dr. W. E. Sumpner, was then resumed by Prof. Ayrton. A long table of numbers accompanying the paper, and representing the result of experiments on many galvanometers, was explained. From this it appeared that galvanometers of the D'Arsonval type were exceedingly efficient in proportion to the amount of wire used in the coils. It was for this reason that voltmeters with strong permanent magnets could be made sensitive even with an exceedingly large external resistance in series so as to diminish the power absorbed by the instrument. The space occupied by the wire was so exceedingly valuable that the extra resistance did not too much diminish the sensibility. The most sensitive galvanometers should therefore be made of the permanent magnet type. If, however, the magnets were to form part of the moving system, as in most galvanometers, the experiments showed that instruments of the Rayleigh, Gray, or Rosenthal type were the best. The coils should be numerous and small, as Mr. Boys had previously shown. As an astatic system of needles sets itself perpendicular to the earth's field, it was recommended that astatic galvanometers should be placed so that the needles pointed east and west. The controlling magnet would then not need to be turned round as it was raised or lowered. It was recommended to calibrate low-resistance ballistic galvanometers for quantity by measuring the deflection for a known current. This obviates the necessity for large condensers or high potentials. The method, although not new, is not described in text-books. In conclusion, Prof. Ayrton asked for information with regard to microscope galvanometers. C. V. Boys, F.R.S., thought that the factor of merit of galvanometers should not be given in scale divisions per micro-ampere under the condition of constant controlling moment. This gave too great an advantage to instruments of the Gray or Rosenthal type. Great sensibility could be obtained by diminishing the moment of inertia of the suspended parts, the practical limit being determined by the trouble due to the silk fibre. Spider lines, when used in place of silk fibres, gave better results. It was possible by using a good suspending arrangement to use needles $\frac{1}{8}''$ long and a period of 20 seconds, and to gain a sensibility far greater than those indicated in the paper. Ballistic galvanometers should be made with needles as light as possible. The method proposed, of winding the central part of the coil in the opposite sense to the rest, would probably not be good, owing to the unevenness of the field produced. The conclusion come to by the author, that D'Arsonval galvanometers of great sensibility should be made with small coils placed in a very strong field, was one he had himself come to, but had finally abandoned owing to difficulties caused by diamagnetism in the copper and to excessive damping due to Foucault currents. Mr. Swinburne thought that the factor of merit of a galvanometer should be determined differently according as it was to be used for the measurement of current, or quantity, or for null methods merely. He saw no great advantage in making practical instruments proportional. The name D'Arsonval should be dropped, as the instrument denoted by it was invented by Varley years ago. He would like to know the relative sensibility of the telephone and the Lippman galvanometer. Prof. Fitzgerald stated that Lord Rayleigh had shown that the microscope method of observing angular deflections was as sensitive as the ordinary method of mirror and scale, even when only the mirror was used as a pointer, so that if a pointer were attached it would be far more sensitive. The drawback, however, was that it was impossible to distinguish with the microscope between lateral displacements of the needles and the angular motion whose measurement was required. To get over this error it was necessary to read both ends of the pointer, but this was hard to do. Prof. Ayrton replied to the different points raised in the discussion.

Entomological Society, February 5.—The Right Hon. Lord Walsingham, F.R.S., President, in the chair.—The President announced that he had nominated Mr. J. W. Dunning, Captain H. J. Elwes, and Mr. F. D. Godman, F.R.S., Vice-Presidents for the session 1890–91.—Mr. F. D. Godman exhibited a specimen of *Papilio thoas*, from Alamos, Mexico, showing an aberration in the left hind wing. Mr. R. Trimen, F.R.S., remarked that butterflies of the genus *Papilio* were seldom liable to variation.—Mr. C. G. Barrett exhibited a series of specimens of *Phycis subornatella*, Dup., from Pembroke, the east and west of Ireland, the Isle of Man, and Perthshire; and a series of *Phycis adornatella*, Tr., from Box Hill, Folkestone, Norfolk, and Reading; also a number of forms intermediate between the above, taken in the Isle of Portland by Mr. N. M. Richardson. He said that these forms proved the identity of the two supposed species, which he believed were both referable to *P. dilutella*, Hb. He also exhibited specimens of *Hesperia lineola*, and a pale variety of it taken in Cambridgeshire; specimens of *Epischnia bankesiella*, a recently-described species, taken in Portland; and a specimen of *Retinia margarotana*, H.-S., a species new to Britain, discovered amongst a number of *Retinia pinivorana*, which had been collected in Scotland.—Mr. W. H. B. Fletcher showed a series of *Gelechia fumatella*, from sandhills in Hayling Island and near Littlehampton, and, for comparison, a series of *G. distinctella*, from the same places. He also showed a few bred specimens of *G. terrella*, and a series of preserved larvæ. He stated that on the downs the larvæ live in the middle of the tufts of such grasses as *Festuca ovina* and allied species.—Mr. H. Goss read a communication from Dr. Clemow, of Cronstadt, St. Petersburg, on the subject of the coincidence of vast flights and blights of insects during the years 1510, 1757, 1763, 1782, 1783, 1836, and 1847, and the epidemic of influenza. During the year 1889 no unusual activity in the insect world had been recorded. Mr. H. T. Stainton, F.R.S., and Mr. McLachlan, F.R.S., made some remarks on the subject, the purport of which was that there was no connection between epidemics and the occurrence of swarms of insects.—Mr. G. A. J. Rothney communicated a paper entitled "Notes on Flowers avoided by Bees." It appeared, according to the author's observations, made in India, that dahlias were exceptionally attractive, but that the passion-flower was only resorted to by a few species of *Xylocopa;* and that, with one exception, he had never seen any insects feeding on the flowers of the oleander. Mr. Slater, Colonel Swinhoe, Mr. Trimen, Lord Walsingham, and Mr. McLachlan took part in the discussion which ensued.—Dr. D. Sharp read a paper entitled "On the Structure of the Terminal Segment in some male Hemiptera."—Colonel Swinhoe read a paper entitled "On the Moths of Burma," which contained descriptions of several new genera and 107 new species.—Dr. F. A. Dixey read a paper entitled "On the Phylogenetic Significance of the wing-markings in certain genera of the *Nymphalidæ.*" A discussion ensued, in which Lord Walsingham, Mr. Jenner-Weir, Captain Elwes, and Mr. Trimen took part.

Zoological Society, February 4.—Prof. W. H. Flower, F.R.S., President, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of January 1890.—A communication was read from Mr. W. K. Parker, F.R.S., containing an account of the morphology of the Hoatzin (*Opisthocomus cristatus*). The author treated of the early stages of the development of this Reptilian Bird, and its shoulder-girdle, sternum, and hind limbs.—A communication was read from Mr. A. D. Bartlett, containing observations on Wolves, Jackals, Dogs, and Foxes. Mr. Bartlett's remarks tended to show that all the varieties of Domestic Dogs owe their origin to Wolves and Jackals, and that the habit of barking has been acquired by, and under the influence of, domestication; also that the Dog is the most perfectly domesticated of all animals.—A communication was read from Mr. G. E. Dobson, F.R.S., containing a synopsis of the genera of the family Soricidæ. The author recognized nine genera, and divided them into two sub-families. New methods of defining the genera were introduced, each genus was briefly characterized, and remarks on certain genera, not admitted in the synopsis (although hitherto generally recognized), were appended.—Mr. F. E. Beddard read a paper containing observations upon some species of Earthworm of the genus *Perichæta.*—A communication was read from Mr. J. M. Leslie, containing notes on the habits and oviposition of the clawed Aglossal Frog (*Xenopus lævis*), as observed at Port Elizabeth, Cape Colony, where this species was said to be of ordinary occurrence.—Mr. Oldfield Thomas read an account of a collection of Mammals from Central Vera Cruz, Mexico, made by a scientific expedition organized by the authorities of the Mexican Museum, under the superintendence of Dr. F. Ferrari-Perez. The collection consisted of about 100 specimens, belonging to 21 species. Amongst these, two (a Hare and a Squirrel) were described as new, and proposed to be called *Sciurus niger melanonotus* and *Lepus veræ-crucis.*

Geological Society, February 5.—W. T. Blanford, F.R.S., President, in the chair.—The following communications were read:—The variolitic rocks of Mont-Genèvre, by Grenville A. J. Cole and J. W. Gregory.—The propylites of the Western Isles of Scotland, and their relations to the andesites and diorites of the district, by Prof. John W. Judd, F.R.S.

EDINBURGH.

Royal Society, January 27.—Rev. Prof. Flint, Vice-President, in the chair.—Prof. Calderwood read a paper on evolution and man's place in Nature. A discussion followed.

February 3.—Sir W. Thomson, President, in the chair.—Dr. William Peddie read a paper on new estimates of molecular distance. He showed that the ratio of the latent heat of vaporisation of a liquid to six times its surface-tension gives an approximation to the number of molecules per linear unit in that liquid. The liquids water, alcohol, ether, chloroform, carbon bisulphide, turpentine, petroleum, and wood spirit, have, according to this method, 50, 52, 30, 15, 19, 30, 40, and 70 millions, respectively, of particles per linear centimetre. Of course no stress is to be laid upon the relative values of these numbers; the point of interest is the complete agreement as to the order of the unknown quantity.—Prof. Tait communicated a paper by Prof. Dittmar on the gravimetric composition of water.—Mr. John Aitken read a paper on the number of dust-particles in the atmosphere of certain places in Great Britain and on the Continent, with remarks on the relation between the amount of dust and meteorological phenomena. He believes that dust condenses moisture before the air is saturated. For the same number of dust-particles per cubic centimetre, the atmospheric transparency depends upon the depression of the wet bulb, being large when the depression is large, but becoming small before the depression vanishes. Increase of temperature also reduces transparency when the number of particles remains the same, for increase of temperature means increase of vapour-pressure. As a rule, quantity of dust decreases when the wind increases. When calms occur dust accumulates. This increases the radiating power of the air, so that it cools quickly and fog forms. Thus a fog may be regarded as a suspended dew.—The dust-measuring instruments intended for use at Ben Nevis were exhibited.

PARIS.

Academy of Sciences, February 10.—M. Hermite in the chair.—Note on an unpublished memoir of Descartes', indicating the right of the author to the priority of a discovery in the theory of polyhedrons, by M. De Jonquières. Some passages are pointed out in the memoir which show that Descartes knew and applied the formula $F+S=A+2$, and furnished the elements of the demonstration, hence his name should be associated with that of Euler as an independent discoverer of the famous formula.—A physical process for the measurement of the inclination of the declination-thread of meridian-circles, by M. Hamy. With ordinary astronomical methods this value can be determined to within half a degree, but using the process described, it is possible to obtain it within a few seconds. The complete description will be given in the coming number (January) of the *Bulletin Astronomique.*—Upon the exponential function, by M. Stieltjes. A demonstration is given of a relation of the form

$$N+e^{a}N_1+e^{b}N_2 \;.\;.\;.\;.\; +e^{h}N_n=0 \quad .\;.\;.\;.\;.\; (1)$$

$a, b, \ldots, h$ being whole numbers, $N, N_1, N_2, \ldots N_n$ coefficients. Starting with the polynomial function

$$F(z)=z^{\mu}(z-a)^{\mu+k_1}(z-b)^{\mu+k_2} \;.\;.\;.\;.\; (z-h)^{\mu+k_n}$$

the author deduces that assuming (1) to hold

$$\int_0^h \phi(z)e^{-z}F(z)dz=0,$$

and then proves this function not to hold if μ be an even number.—Note on a method of transformation in kinematic geometry, by M. A. Mannheim. In a preceding communication the author has shown how to transform the properties relating to the displacement of a straight line, of which the points describe trajectory surfaces; he now extends his method to the case where the points of the movable line describe trajectory lines only, and taking as examples several theorems relating to the former case, derives therefrom corresponding theorems in the latter.—On a generalization of Euler's theorem relating to polyhedrons, by M. R. Perrin. Attention is drawn to some relations bearing upon Euler's formula, published by the author in 1882 (*Bulletin de la Société Mathématique de France*, t. x.).—On bodies which give a tension of dissociation equal to the tension of the vapour of their saturated solutions, by M. H. Lescœur. Experiments are referred to which are antagonistic to the theory of M. Bakhuis-Roozeboom. According to experiment, the curves representing the tensions referred to as functions of the temperature are tangential, and do not intersect at an acute angle as required by the theory.—Action of fluorine upon different varieties of carbon, by M. Henri Moissan.—A general method for the preparation of fluorides of carbon, by M. C. Chabrié.—On the blue flame of common salt and the spectroscopic reaction of copper chloride, by M. G. Salet. The author finds that the bands seen in the spectrum of salt burning in a common fire, and of which the strongest are situated in the indigo and blue-green, are due to copper chloride, and coincide with bands given by Lecoq de Boisbaudran in his "Spectres Lumineux."—On the electrical resistance of iron and its alloys at high temperatures, by M. H. Le Chatelier. The electrical resistances for a considerable range of temperature of a number of iron alloys have been examined. When the results are graphically shown, the curve for ferro-manganese (13 per cent. Mn) is found to be regular, just as is the case with platinum or platinum-rhodium alloy, while the curves for mild and hard steels show distinctly two singular points at 820° and 710°, and a silicon steel (Si = 3 per cent.) shows the former only. Ferro-nickel (25 per cent. Ni) behaves very peculiarly, as below 550° two modifications having quite distinct properties exist, and nickel itself shows a sudden change of curvature at 340°.—Thermochemical researches upon silk, by M. Léo Vignon. Investigations have been made to determine the heat disengaged when various reagents are absorbed by raw and prepared silk. A discussion of the results seems to indicate that the method may be employed to elucidate the theory of dyeing.—Estimation of potassium and humus in soil, by M. J. Raulin. A method of estimating potassium by weighing it on a tared filter as phosphomolybdate is described, together with the application of the modified permanganate process of J. H. Schmidt to the determination of humus.—On a colouring-matter from Diaptomus, analogous to the carotin of vegetables, by M. Raphael Blanchard. The colouring-matter, isolated from these animal organisms, is shown to differ considerably in spectroscopic properties and in its solubility in alcohol from the lipochromes, and it does not prove to be identical with any of the red pigments from the Cœlenterata, Echinodermata, Bryozoa, or Mollusca; while on the contrary it is found to show many analogies to carotins ($C_{26}H_{38}$), which are so marked as to lead to the conclusion that it is itself a carotin and so possesses great interest as a colouring substance common to both the animal and vegetable kingdoms, and as an instance of the production of a hydrocarbon by animal agency.—On the intercellular substance, by M. Louis Mangin. It is shown that among Phanerogams and Cryptogams (with the exception of Fungi and many Algæ) the tissues of the softer parts are composed of cells cemented together by an intercellular substance composed of insoluble pectates.—On the localization of colouring-matters in the seminal integuments, by M. Louis Claudel.—Formation of quartz at the spring of Maubourot at Cauterets, by M. Beaugey.—On the existence of leucite rocks in Asia Minor, and on some hypersthene rocks from the Caucasus, by M. A. Lacroix. It is found that the leucitic rocks from near Trebizonde fall under two main types, leucitite and leucotiphrite.—Upon the composition of some pseudo-dolomitic chalks from the north of France, by M. L. Cayeux.

Berlin.

Meteorological Society, January 7.—Dr. Vettin, President, in the chair.—Dr. Wagner spoke on the behaviour of water in the soil. The relationships between surface water and springs and deposits, possessing as they do a distinct meteorological interest, have as yet been but slightly investigated, probably because the behaviour of water in soil occupies the border-land between the subjects of meteorology, geology, agriculture, and hygiene. A review of scientific investigations which have so far been made on the subject of surface water and the formation of springs, shows that the problems of most importance are still awaiting their solution. In the speaker's opinion the task to be undertaken in the interests of meteorology is the establishing of as many lysimeters as possible, so that by keeping a continuous record of their indications a continued set of observations on surface water would be provided. He further considered it to be essential that the relationship of water to the soil should be investigated at depths far greater than has as yet been the case. A lengthy discussion followed the above communication, which turned chiefly upon a consideration of the forces, as yet but little known, which determine the collecting of water on internal impervious layers of the earth.—Prof. Spörer gave a short statistical statement on sun-spots during 1889. The chief point of interest was that the spots appeared during the first half of the year in the lower latitudes and in the second half in the higher. Taking the year as a whole, there were considerably more spots in the southern than in the northern hemisphere; this has been the case in each year since 1883.—The Secretary then handed in his annual report, and the Society proceeded to elect its officers for the year 1890. Prof. Schwalbe was elected President.

Physical Society, January 27.—Prof. Kundt, President, in the chair.—The President opened the meeting by a short address in memory of civil engineer G. A. Hirn, who died recently at Logelbach in Alsace.—Dr. Lehmann spoke on the testing of tuning-forks. After the International Congress met for the establishing of a uniform standard of tone, and selected for this purpose a vibration frequency of 435, it devolved upon Government to construct a standard fork, and to devise some ready method for testing ordinary forks to an accuracy within half a vibration per second, and standard forks within 0·1 of a vibration. The speaker discussed the various methods in use for comparing two forks and for counting the number of vibrations per second which they yield. For the first purpose the vibrations of the respective forks are employed, these being observed either acoustically or optically; a further means of effecting the comparison is by the stroboscopic method or by the acoustic wheel. The vibration frequency of a fork is determined either graphically or by means of a tuning-fork clock, or by means of the undulations obtained by oscillating or rotating acoustical instruments. An important factor in all these methods is the temperature of the fork. To determine this a special thermostat is employed, by means of which the fork can be set in vibration in an air-bath whose temperature is constant and accurately known. The standard fork for reference is one of König's, whose vibration-frequency has been accurately determined by several methods. The comparison of any new fork with the standard is made by means of the acoustic wheel, and by a simultaneous graphic recording of the movements of the fork which is vibrating inside the thermostat, and of the magnetic interrupter; the latter consists of a tuning-fork vibrating to the octave below the note yielded by the standard fork.—Dr. Eschenhagen exhibited curves of the three elements of terrestrial magnetism recorded by the new instruments in the Observatory of Potsdam, and gave a short description of the arrangement of the apparatus. The curves were taken on white photographic paper, and were of such dimensions that the greatest variations which have as yet been observed were completely recorded.—Prof. Kundt exhibited some quartz-fibres which he had received from Prof. Weinhold. He made, in addition, some remarks on the preparation of these fibres by Boys's method, and gave some data as to the dimensions of an apparatus which Prof. Weinhold had constructed for the measurement of gravitation constants, and had employed in several determinations.

Amsterdam.

Royal Academy of Sciences, Dec. 28, 1889.—Prof. van de Sande Bakhuyzen in the chair.—M. Hugo de Vries related the results of the scientific researches made by the Committee of Advice, appointed in July 1887 at Rotterdam, to report on the appearance of Crenothrix in the drinking-water of the Rotterdam water-supply. He gave an account of the organisms met with in the mains and basins before and after the filtration of the water, and of the degree of the pollution caused by these creatures in the colder and warmer months of the year. He spoke also of the influence of darkness on the water-organisms, which, under ordinary circumstances, live in the sunlight; of the proposals made by the Committee to mitigate or remove the evil; and of the improvements effected, or about to be effected, in accordance with those suggestions.—M. Kapteijn treated of chronographical observations for the purpose of determining parallaxes of fixed stars. After having explained the precautions taken to prevent systematic error, he gave the results and subjected them to several tests showing their absolute trustworthiness within the limits defined by the probable errors.

Jan. 25.—Prof. van de Sande Bakhuyzen in the chair.—M. Hoogewerff, giving an account of joint work by himself and M. van Dorp, spoke of the action of potassium hypobromite on succinphenylamide, and on the amide of cinchonic acid.—M. van Bammelen communicated certain results of a research relating to the composition of volcanic and other soils, on which, in Deli and Java, tobacco is cultivated. The extraordinary fitness of the soil of the cleared forest grounds in Deli for the production of exquisite tobacco is to be attributed, he thinks, to the peculiar composition of the amorphous silicate occurring therein, to the looseness of the forest soil, and to the auspicious climate with regard to the rainfall. He concluded by insisting on the urgent need for the establishment of a scientific experimental station at Deli. Such an establishment would be favourable to the culture of tobacco, and would enlarge our knowledge of the soil, of the vegetable world, and of geological formations.

DIARY OF SOCIETIES.

London.

THURSDAY, February 20.

Royal Society, at 4.30.—A Comparative Study of Natural and Artificial Digestions (Preliminary Account): Dr. A. Sheridan Lea.—On a Fermentation causing the Separation of Cystin: Sheridan Delépine.—Some Stages in the Development of the Brain of Clupea harengus: Ernest W. L. Holt.

Linnean Society, at 8.—On the Fruit and Seed of Juglandia; on the Shape of the Oak-leaf; and on the Leaves of Viburnum; Sir John Lubbock, Bart., P.C., M.P., F.R.S.

Chemical Society, at 8.—The Behaviour of the most Stable Oxides at High Temperatures: G. H. Bailey and W. B. Hopkins.—The Influence of Different Oxides on the Decomposition of Potassium Chlorate: G. J. Fowler and J. Grant.

Zoological Society, at 4.

Institution of Electrical Engineers, at 8.

Royal Institution, at 3.—The Three Stages of Shakspeare's Art: Rev. Canon Ainger.

FRIDAY, February 21.

Geological Society, at 3.—Annual General Meeting.

Physical Society, at 5.—On a Carbon Deposit in a Blake Telephone Transmitter: F. B. Hawes.—The Geometrical Construction of Direct Reading Scales for Reflecting Instruments: A. P. Trotter.—A Paralle Motion Suitable for Recording-Instruments: A. P. Trotter.—On Bertrand's Refractometer: Prof. S. P. Thompson.

Institution of Civil Engineers, at 7.30.—Some Types of American Locomotives, and their Construction: C. N. Goodall.

Royal Institution, at 9.—Magnetic Phenomena: Shelford Bidwell, F.R.S.

SATURDAY, February 22.

Royal Botanic Society, at 3.45.

Royal Institution, at 3.—Electricity and Magnetism: Right Hon. Lord Rayleigh, F.R.S.

SUNDAY, February 23.

Sunday Lecture Society, at 4.—Our Ancestors, the Sea-Kings: Justin H. McCarthy, M.P.

MONDAY, February 24.

Society of Arts, at 8.—Stereotyping: Thomas Bolas.

Toynbee Philosophical Society, at 8.—Will and Reason: B. Bosanquet.

TUESDAY, February 25.

Anthropological Institute, at 8.30.—Exhibition of Stanley's Spirometer: Dr. J. G. Garson.—Some Borneo Traps: S. B. J. Skertchly.—The Diēri and other Kindred Tribes of Central Australia: A. W. Howitt.

Institution of Civil Engineers, at 8.—The Shanghai Water-Works: J. W. Hart.—The Tytam Water-Works, Hong-Kong: Jas. Orange.—The Construction of the Yokohama Water-Works: J. H. T. Turner. (Discussion.)

Royal Institution, at 3.—The Post-Darwinian Period: Prof. G. J. Romanes, F.R.S.

WEDNESDAY, February 26.

Geological Society, at 8.—On a Crocodilian Jaw from the Oxford Clay of Peterborough: R. Lydekker.—On the Relation of the Westleton Beds or "Pebbly Sands" of Suffolk to those of Norfolk, and on their Extension Inland; with some Observations on the Period of the Final Elevation and Denudation of the Weald and of the Thames Valley, Pari III.: Prof. Joseph Prestwich, F.R.S.—On a Deep Channel of Drift in the Valley of the Cam, Essex: W. Whitaker, F.R.S.

Society of Arts, at 8.—The English in Florida: Arthur Montefiore.

THURSDAY, February 27.

Royal Society, at 4.30.

Society of Arts, at 5.—The Northern Shan States and the Burma-China Railway: William Sherriff.

Institution of Electrical Engineers, at 8.

Royal Institution, at 3.—The Three Stages of Shakspeare's Art: Rev. Canon Ainger.

FRIDAY, February 28.

Amateur Scientific Society, at 8.—Practical Coal-mining: H. S. Streatfeild.

Royal Institution, at 9.—Evolution in Music: Prof. C. Hubert H. Parry.

SATURDAY, March 1.

Essex Field Club, at 7.—Micro-Fungi of Epping Forest; how to Collect, Preserve, and Study Them: Dr. M. C. Cooke.

Royal Institution, at 3.—Electricity and Magnetism: Right Hon. Lord Rayleigh, F.R.S.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Elementary Dynamics of Particles and Solids: Prof. W. M. Hicks (Macmillan).—La Vie des Oiseaux: Baron D'Hamonville (Paris, J. B. Baillière).—A Naturalist's Voyage round the World, new edition, illustrated: C. Darwin (Murray).—A Naturalist among the Head Hunters: C. M. Woodford (Philip).—Geology of the Quicksilver Deposits of the Pacific Slope, and Atlas to accompany same: G. F. Becker (Washington).—Fossil Fishes and Fossil Plants of the Triassic Rocks of New Jersey and the Connecticut Valley: J. S. Newberry (Washington).—Il Teorema del Parallelogramma delle Forze Dimostrato Erroneo: G. Casazza (Brescia).—Materials for a Flora of the Malayan Peninsula: Dr. G. King (Calcutta).—Journal of Physiology, vol. xi. Nos. 1 and 2 (Cambridge).—Transactions of the Wagner Free Institute of Science of Philadelphia, vol. 2 (Philadelphia).—Observaciones Magnéticas y Meteorológicas del Real Colegio de Belen de la Comp. de Jesus en La Habana, Julio-Dic. 1887 (Habana).—Bulletin of the U.S. Geological Survey, Nos. 48 to 53 (Washington).—Department of Agriculture, Melbourne, Bulletin No. 4 (Melbourne).—"Timehri," being the Journal of the Royal Agricultural and Commercial Society of British Guiana, December 1889 (Stanford).

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